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(72) Inventor YOSHIO OGUMA

(19) THE PATENT OFFICE LONDON

(54) A LAMINATE AND A METHOD FOR MANUFACTURING THE SAME

(71) We, FRANCE BED COMPANY LIMITED, a Japanese corporate body, of 31-15, Sakuragaoka-cho, Shibuya-ku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is performed, to be particularly described in and by the following statement:—

This invention relates to an air-permeable flexible laminate comprising thermofusible and non-thermofusible layers bonded in places and a method for manufacturing the same. Such a laminate with the thermofusible and non-thermofusible layers arranged in any combination is employed as a mattress cover, for example. Such a laminate is manufactured by, for example, the following methods:

(1) stitching together the layers

(2) thermally compressing thermofusible and non-thermofusible layers with a hot-melt type fibre-like or film-like adhesive sandwiched therebetween

(3) disposing an adhesive between the thermofusible and non-thermofusible layers and thermally bonding them together.

In method (1) the resulting laminate exhibits a good porosity, but requires a great deal of time to perform; also breakage of the stitching thread is likely to occur with the elapse of time. Since in the method (2) the adhesive is disposed all over the area between the non-thermofusible and thermofusible layers, a strong bond is obtained; but, air-permeability is lost and the laminate is insanitary. Moreover, since some of the adhesive is left unused, method (2) is very uneconomical. In method (3) the fused portion of the thermofusible layer is bonded to the corresponding fibre portion of the non-thermofusible layer. In this case, no problem arises as to air-permeability, but insufficient bonding is realized.

It is accordingly an object of this invention to provide a flexible and air-permeable laminate comprising thermofusible and non-thermofusible layers in any combination and exhibiting a very strong bonding.

A flexible laminate comprises, according to the invention, overlying air-permeable thermofusible and non-thermofusible layers which are compression bonded at spaced locations and of which a non-thermofusible layer constitutes the covering layer on one side of the laminate and is bonded to a contiguous thermofusible layer in such manner that, at each of the locations, the non-thermofusible covering layer firstly is impregnated with a fused portion of the contiguous thermofusible layer and secondly is impregnated from the exterior with a thermofusible material bonded to the fused portion, the laminate being air-permeable except at the spaced locations.

The invention includes a method of manufacturing a flexible laminate comprising forming an assembly of overlying air-permeable thermofusible and non-thermofusible layers with a non-thermofusible layer constituting a covering layer of the assembly and a thermofusible layer contiguous to that covering layer; locating a thermofusible sheet on the exterior of the covering layer; compressing the assembly and the thermofusible sheet together at spaced locations in the direction of the thickness of the assembly; applying heat so that the covering layer at each of the spaced locations is impregnated from opposite directions with the material of the contiguous layer and the thermofusible sheet which materials are fused together and bonded within the covering layer; and removing the thermofusible sheet from the assembly except at the spaced locations, the laminate being air-permeable except at the spaced locations.

The laminate may consist essentially of the covering layer and the contiguous layer, or there may be a further thermofusible layer or layers and/or non-thermofusible layer or layers, all the layers being bonded together at each of the spaced locations. The spaced locations may form a pattern of spots on the covering layer, or may be in the form of spaced lines on the covering layer.

The invention will be more readily understood by way of example from the following description of a method of making a flexible laminate, and the laminate itself, reference being made to the accompanying drawing, in which:—

Figure 1 is a cross-sectional view showing an assembly consisting of a thermofusible layer and a non-thermofusible layer;

Figure 2 illustrates the bonding of the assembly;

Figure 3 shows the bonded portion of the resulting laminate;

Figure 4 is a cross-section on the line IV-IV of Figure 3; and

Figure 5 is a plan view of part of the finished laminate.

In the specification, "a non-thermofusible layer" is intended to mean a material which is unsuitable for subjection to a normal thermal fusion treatment and may be constituted by a fibrous material such as a woven or non-woven fabric, or by a foamed mass having that property. By way of example, it may be made of natural fibre, synthetic resin fibre, glass fibre, and a blend of natural fibre and synthetic resin fibre. "A thermofusible layer" is intended to mean any material which is regarded as suitable for subjection to a normal fusion treatment and may be constituted by any thermofusible fibrous material such as a woven or non-woven fabric, or by a foamed mass. By way of example, it may be made of a thermoplastic synthetic resin fibre such as nylon, acrylic, polyester and polypropylene; a thermoplastic synthetic resin fibre blended with a natural fibre; or a thermoplastic resin foamed mass such as polyurethane foam, or polyvinyl chloride foam.

Any combination of the non-thermofusible layer and thermofusible layer may be arbitrarily selected. However, a non-thermofusible layer is disposed on an outer surface of a laminate as a covering, and is contiguous with an inner thermofusible layer. With a non-thermofusible layer and a thermofusible layer represented by A and B, respectively, a variety of combinations can be considered such as, for example, A-B, A-B-A, A-B1-B2, A-B1-B2-A, A-B-A-B, A-B1-B2-B3, and A-B-A-B-A in which B1, B2, B3 indicate layers of different thermofusible materials.

One method for preparing such laminates will be explained below.

A pair of thermofusible sheets C of a material compatible with the non-thermofusible layers A are disposed one on each outer surface of, for example, the above-mentioned composite layer A-B-A. Then, the resultant composite layer C-A-B-A-C is compressed at spaced locations in a pattern of dots arranged in a linear fashion from both the sides thereof for a predetermined length of time to cause the thermofusible sheet C and thermofusible layer B to be fused to permit them to be impregnated into the non-thermofusible layer A from both the surfaces thereof. As a result, the thermofusible sheet and layer are intimately bonded to the non-thermofusible layer A to constitute a laminate. As means for fusing the thermofusible sheet and thermofusible layer, conventional heating means such as ultrasonic wave and high frequency heating may be adopted. After bonding is effected each thermofusible sheet C is removed from the adjacent non-thermofusible layer. Since, in this case, the fused portions of each thermofusible sheet are intimately bonded to the non-thermofusible layer, the removed sheet is torn in places (in a dot-like fashion or in a linear fashion). The used sheet can be used several times by shifting it a little each time so that the non-torn portions of the sheet can be used. As a material for the thermofusible sheet, a thermoplastic synthetic resin may be used.

There will now be explained the manufacture of a mattress cover by reference to the drawings; in that manufacture, and unlike the method described above, a non-thermofusible layer constitutes the covering of the laminate at one side only, and a thermofusible sheet is applied to only that side.

In Figure 1, reference numeral 1 denotes an assembly consisting of a thermofusible layer 2 of a polypropylene fibre fabric and an overlying non-thermofusible layer 3 of a rayon cloth. The assembly 1 is fed to an ultrasonic wave application device so as to effect bonding. The ultrasonic wave bonding device as diagrammatically shown in Figure 2 comprises a vibrating tool 4, a roller type anvil 5 opposite to the tool 4, and take-up and supply rolls 6 and 7 provided one at each side of the anvil 5. A plurality of projections are mounted upright on the peripheral surface of the anvil 5. The tool 4 is adapted to move during the rotation of the anvil into close proximity to the projection of the anvil. The projections 8 may be suitably arranged on the outer periphery of the anvil, for example, in a spiral or parallel fashion. Dur-

ing the feeding of the assembly toward the ultrasonic wave bonding device, a thermofusible polypropylene sheet 9 is fed in contact with the non-thermofusible layer 3 from the supply roll 7 toward the take-up roll 6. The assembly 1 and thermofusible sheet 9 are compressed between the tool 4 and the projection 8, while being subjected to vibration by ultrasonic waves, to cause the thermofusible layer 2 and thermofusible sheet 9 to be fused together by being impregnated into opposite surfaces of the non-thermo-fusible layer 3. At this time, the portion of the non-thermofusible layer 3 contained within the compressed portion 10 has its fibres collapsed flat as shown in Figure 4, while the spaces between the fibres are pushed open, as shown in Figure 3, by the vibration due to the ultrasonic waves to permit the thermofusible sheet 9 and the thermofusible layer 2 to be fused together. With the continued rotation of the anvil 5 the sheet 9 is so peeled off the composite layer 1 that that portion of the sheet corresponding to the fused portion 10 is torn apart from the sheet. At the same time the fused portion 10 is cooled and solidified. Though the sheet 9 so wound around the take-up roll 6 is torn in places, the sheet 9 can be used several times by shifting it as mentioned above.

The synthetic resin fibre cloth layer 2 and thermofusible sheet 9 are intimately bonded at their fused portion to the non-thermofusible layer 3, and the non-thermofusible layer is sandwiched between the fused portion of the thermofusible layer 2 and the fused portion of the thermofusible sheet 9 as shown in Figure 4.

In consequence, the thermofusible layer 2 is not easily separated from the non-thermofusible layer 3. The laminate is clearly contoured at the bonded portions 10 to provide a quilting effect. If a coloured sheet is used, a pleasing appearance can be imparted to the laminate. Figure 5 shows one example of a dot patterned laminate, but any other pattern may be selected as required.

Since the laminate has the non-thermofusible layer 3 intimately bonded between the thermofusible layers, a larger bonding strength is obtained. Only at the bonded portions 10, is the assembly so compressed that no voids remain. Thus, the non-permeability of the final laminate is restricted to the bonded portions 10 and, therefore, sufficient permeability can be provided to the laminate. A beautiful outer appearance is also obtained.

As the thermofusible sheet 9 is expended only to the spaced bonding locations and can be used repeatedly, the consumption of thermofusible sheet is limited.

WHAT WE CLAIM IS:—

1. A flexible laminate comprising overlying air-permeable thermofusible and non-thermofusible layers which are compression bonded at spaced locations and of which a non-thermofusible layer constitutes the covering layer on one side of the laminate and is bonded to a contiguous thermofusible layer in such manner that, at each of the locations, the non-thermofusible covering layer firstly is impregnated with a fused portion of the contiguous thermofusible layer and secondly is impregnated from the exterior with a thermofusible material bonded to the fused portion, the laminate being air-permeable except at the spaced locations.

2. A flexible laminate according to claim 1, in which the spaced locations are arranged in a predetermined pattern on the covering layer.

3. A flexible laminate according to claim 1 or claim 2, in which, at each of the spaced locations, the layers are so compressed that no voids remain.

4. A method of manufacturing a flexible laminate comprising forming an assembly of overlying air-permeable thermofusible and non-thermofusible layers with a non-thermofusible layer constituting a covering layer of the assembly and a thermofusible layer contiguous to that covering layer; locating a thermofusible sheet on the exterior of the covering layer; compressing the assembly and the thermofusible sheet together at spaced locations in the direction of the thickness of the assembly; applying heat so that the covering layer at each of the spaced locations is impregnated from opposite directions with the materials of the contiguous layer and the thermofusible sheet which materials are fused together and bonded within the covering layer; and removing the thermofusible sheet from the assembly except at the spaced locations, the laminate being air-permeable except at the spaced locations.

5. A method according to claim 4, in which the heating is effected by ultrasonic wave heating.

6. A flexible laminate, substantially as hereinbefore described with reference to the accompanying drawing.

7. A method for manufacturing a flexible laminate, substantially as hereinbefore described with reference to the accompanying drawing.

BATCHELLOR, KIRK & EYLES,
Chartered Patent Agents,
100, Great Russell Street,
London, WC1B 3LA.
For the Applicants.

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1459106 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

FIG. 1

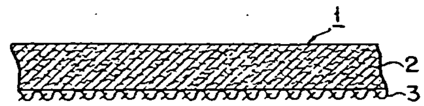

FIG. 2

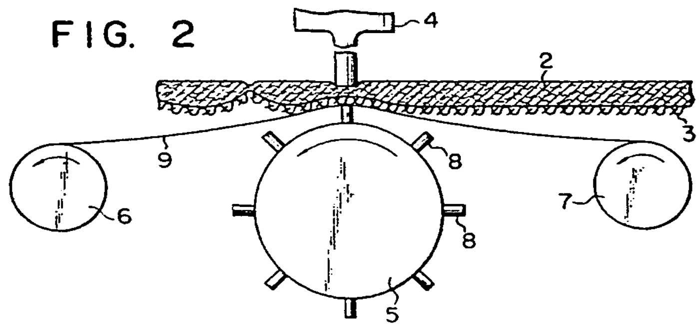

FIG. 3

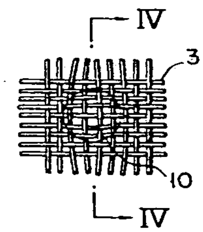

FIG. 4

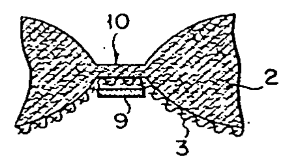

FIG. 5